

Analysis of the Arrangement of Renal Hilar Structure and Their Variation

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Abstract

Introduction: The hilum is the intermediate concavity of the kidney's lateral edge that allows urinary vessels, lymphatic vessels, nerve plexus, as well as renal pelvis to transfer through it all and connect with the renal sinus. The main structures that pass through the hilum from front to back are the renal vein, urinary artery, as well as renal tubules. A subsidiary of the renal artery as well as distributaries of the renal vein typically transfers behind several renal pelvis. Variations in the configuration of renal hilar frameworks were frequently discovered by chance during investigatory image analysis as well as angiography methods. In the Indian population, nevertheless, there have been relatively few thorough anatomy research on the primary renal hilar systems. Researchers evaluated the configuration of significant renal hilar systems in the Indian population because it is important throughout urological surgical procedure as well as kidney transplantation.

Aims and Objectives: To observe and document the renal hilar variation in samples of kidney specimens.

Methods: The current study was conducted on 70 specimens from recently deceased bodies. The samples maintained in 10% formol saline were rinsed. After that, the samples were placed in a metallic tray, and the surrounding fat and other undesirable structures were carefully removed, but the structures at the hilum remained in place. The relationship between the renal arteries and the renal pelvis at the hilum was then studied broadly, and findings were made.

Results: The renal vein was detected anteriorly in 69 (98.57%) kidneys and only 1 (1.25%) kidney was found with a renal artery anteriorly. The renal vessels were arranged anterior to posterior in the center of the hilum. The renal pelvis was seen to be two fold in each of the two 2 (2.85%) kidneys.

Conclusion: There was a 1.25% difference in the arrangement of renal arteries when the hilum of the kidneys was examined anteriorly and in the center, whereas 2.85% of kidneys had a double renal pelvis posteriorly. In 12% of kidneys, the posterior division of the renal artery was visible behind the renal pelvis. Very little (1%) variance is seen here in the renal vessels' middle and anterior positions. However, the location of the renal pelvis, which is always found posteriorly near the hilum, is the same. Occasionally, the renal artery's posterior division is visible behind the renal pelvis.

Keywords: Renal Hilum, Pelvis, Kidney, Hilar, Kidney.

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Introduction

Kidney of human is located at the opposite side of each vertebral column from T12 to L3 vertebral column [1]. The normal kidney measures 11X6X3 cm [2]. In general, ultrasound-measured values are less accurate than radiographer measurements [3]. The hilum is the intermediate concavity of the kidney's lateral edge that allows urinary vessels, lymphatic vessels, nerve plexus, as well as renal pelvis to transfer through it all and connect with the renal sinus [4]. When ascending from the pelvis, the anteriorly facing hilum should rotate 900 m. It is possible for it to keep lying side-wards, resulting in an unexpected excretory urography arrangement [5]. The hilum is approximately 5cm from the middle line, 2.5cm from the top pole, as well as 7.5cm from the lesser pole [6]. The main structures that pass through the hilum from front to back are the renal vein, urinary artery, as well as renal tubules [7]. A subsidiary of the renal artery as well as distributaries of the renal vein typically transfers behind several renal pelvises [5-7].

The kidneys are two major excretory organs that secrete metabolic waste and maintain electrolyte as well as equilibrium of water. Those who also serve as endocrine organs, generating erythropoietin, where it influences red blood cell establishment, as well as renin, that also regulates blood pressure. The renal hilum is the middle concavity of the lateral edge that communicates with the renal sinus. The right kidney's hilum is 5 cm below and the left kidney's hilum is 5 cm above the Trans pyloric plane. The kidney's hilum leads into a central sinus that is adjoined more by renal capsule in addition to then virtually totally full through the renal pelvis as well as vessels, with fat filling the remaining space [8]. The renal vein, renal artery, in addition to renal pelvis have traditionally been

referred to in anatomically course book since beginning towards end as the renal vein, renal artery, in addition to renal pelvis [9, 10].

However, there have been reports of differences in the disposition of renal hilar assemblies. Standing et al. (2008) estimate that approximately 70% of people have a solitary renal artery. The branching pattern of the renal artery can differ. A posterior tributary of the renal vein may exist, passing anterior or posterior to the pelvis and renal artery [9,11]. In the treatment of certain kidney disorders, nephrectomy is the preferred therapeutic procedure, and functional nephron units are spared [12].

Whatever corrective surgery of the renal, including traditional as well as laparoscopic nephrectomy, nephrolithotomy, pyelolithotomy, as well as kidney transplant, necessitates a thorough understanding of the regular as well as variation anatomy of frameworks at the renal hilum [13]. Endopyelotomists must be familiar with the frameworks at the renal hilum in order to conduct hilar evisceration. Although debridement into the hilar region is difficult, it is required in renal pelvic surgical procedure, totally open stone surgical procedure.

Nephrectomy is a therapeutic method of treating specific kidney problems that preserves the functionalities of the nephrons [14]. Because it requires the ability to ligate but rather clamp the vessels existing in the limited spread hilum, a Laparoscopic Partial Nephrectomy (LPN) operation is an extremely complex as well as technically demanding challenge for urologists [13]. Personal formation clamping, on the other hand, outperforms en-bloc clamping processes [14]. As a result, before embarking on a surgical approach, it is critical to have a full knowledge of the

renal hilar composites' frameworks, since these adjustments as well as the amount of frameworks in the hilum are significantly varied than the precise trends given in recent publications.

A systematic study focusing on the structural arrangement at the renal hilum has rarely been published in the literature. Variations in the configuration of renal hilar frameworks were frequently discovered by chance during investigatory image analysis as well as angiography methods. In the Indian population, nevertheless, there has been relatively few thorough anatomy research on the primary renal hilar systems. Researchers evaluated the configuration of significant renal hilar systems in the Indian population because it is important throughout urological surgical procedure as well as kidney transplantation.

Methods

Study design

The current study was conducted on 70 specimens in the Department of Anatomy. The specimens were considered from both males and females. The study was conducted over the period of 2 years. For the purpose of preventing irritation to the eyes and mucosa of the nose, the samples maintained in 10% formol saline were rinsed. After that, the samples were placed in a metallic tray, and the surrounding fat

and other undesirable structures were carefully removed, but the structures at the hilum remained in place. The relationship between the renal arteries and the renal pelvis at the hilum was then studied broadly, and findings were made.

Inclusion and exclusion criteria

The specimens were taken the age of patients were between 30 years and 90 years. The included specimens were not claimed by anyone and had no damages.

The specimens having gross deformity or in which hilum is not visible, were excluded.

Ethical Approval

The study obtained required consent and approval from the hospital and Ethical Committee of the hospital, respectively.

Results

The hilum of 70 kidney specimens was checked before rearward for renal pelvis and renal vessels to observe their relative position. Among them, the renal vein was detected anteriorly in 69 (98.57%) kidneys and only 1 (1.25%) kidney was found with a renal artery anteriorly. The renal vessels were arranged anterior to posterior in the center of the hilum. The renal pelvis was seen posteriorly in all 70 of the kidneys. The renal pelvis was seen to be twofold in each of the two 2 (2.85%) kidneys (table 1 and Figure 1).

Table 1: Structural arrangement at the hilum

Structural arrangement at the hilum	Percentage n (%)
Kidneys when observed before the backward	
Renal artery found anteriorly	1 (1.25%)
Renal vein found anteriorly	69 (98.57%)
Arrangement of vessels at the middle of hilum	
Renal artery found anteriorly	69 (98.57%)
Renal vein found anteriorly	1 (1.25%)
Renal pelvis found posteriorly	70 (100%)
Renal pelvis found double	2 (2.85%)
Posterior division of renal artery behind pelvis	10 (14.28%)

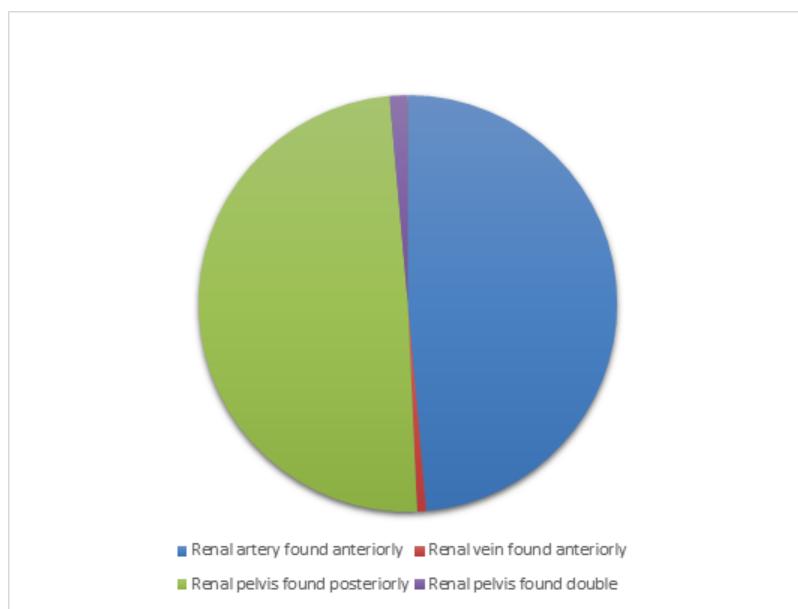


Figure 1: Number of patients in each arrangement of renal artery and pelvis

Discussion

Divya et al. (2018) investigated, evaluated, and reported on the configuration in human bodies of kidney hilar systems. At the Department of Anatomy, Sri Devaraj Urs Medical College, Kolar, 50 pairs of morphologically normal kidneys from preserved human corpses were studied. The renal hilum of each kidney was carefully dissected to determine the configuration of the renal artery, vein, & pelvis, as well as their anterior-posterior connections at the hilum. The configuration of renal hilar frameworks varies hugely. The hilar structure arrangement patterns have been categorized into 12 major structures. In 32% of the kidneys, they discovered the classic clustering of structural hilar described the fundamental in earlier chapters as renal vein, renal artery, as well as pelvis. In 36% of instances, the anterior trunk of the renal artery represents the most anteriorly positioned configuration at the renal hilum. In 21% of the instances, we discovered both anterior and posterior tributaries of the renal vein. The renal pelvis was discovered between the segments of the renal artery as well as the estuaries of the renal vein in 43% of instances. Researchers noticed the

development of the renal pelvis just outside of the hilum in 7% of instances. The current study shows that the structural arrangement at the renal hilum is more variable than the traditional model described in conventional anatomy reading materials. The present investigation may contribute to a better understanding of the topography institution of the renal hilum that is commonly dissected throughout urological surgeries performed on the renal [15].

Jadhav and Zambare (2015) investigated and reported on the evaluation of renal hilar structure arrangement. The study included 57 couples of morphologically regular kidneys from preserved bodies. Each kidney's renal hilum was carefully dissected to reveal the organization of the renal artery, vein, as well as pelvis. The configuration of renal hilar systems varies hugely. There are 10 different correlations in the configuration of renal hilar formations. In 22.80% of the kidneys, researchers found the curriculum configuration of structural hilar. In 32.45% of the instances, researchers discovered anterior as well as posterior tributaries of the renal vein, or the kidney pelvis was the most posterior in 41.22% of the instances. The organization and number of

assemblies at the renal hilum vary greatly from the classical pattern described in standard anatomy textbooks. Accurate information of usual in addition to irregular composition of renal hilar structure arrangement is required in the era of laparoscopic surgery, kidney transplantation, Endopyelotomists, as well as also throughout the evaluation of numerous radiological procedures connected towards the kidney [16].

Gupta et al. (2014) investigated and reported the prevalence of these renal artery differences in the North West Indian population. For the current study, 40 formalin fixed dead bodies were segmented at PGIMER, Chandigarh's Department of Anatomy. The current study discovered the highest incidence of RA origin at the L1 stage (86% on the right side and 80% on the left side). The right renal artery ostium was found to be making things up cranial towards the left renal artery ostium in 70% of the instances, the left renal artery ostium was discovered to lie cranial to the right ostium in 24% of the instances, then both ostia have been found to be trying to lie at symmetrical stages in 6% of the instances. In all cases, the optional thing renal arteries were discovered to really be smaller than the primary renal artery. Researchers noticed a difference in the configuration of formations at the kidney's hilum in one particular instance. The renal vein has been seen condensed between both the branches of the renal artery. Our findings reveal a significant difference in the occurrence of various aspects of numerous renal arteries in the Indian population when compared to other populations [17].

In descriptive study, Hassan et al. (2012) investigated and reported on, at postmortem; The Mymensingh Medical College morgue provided 100 new human kidneys including both males and females but also sides. The age range of the selected cases ranged from five to sixty

years. [18] The samples were saved in order to investigate the discrepancies in the configuration of the major parts at the kidney's hilum across age categories. [19] Whenever the hilum of the kidneys was regarded prior to actually instead of forward, anteriorly, and from the center, there's been 1% modification in the configuration of renal vessels, and yet posterior aspect renal pelvis was discovered in varying amounts, and was double in 2% of renal. The renal artery had a posterior divide in overdue renal pelvis in 12% of renal. The configuration of systems at the hilum varied in 1% of renal.

Conclusion

The placement of the components at the hilum varies, which could pose a challenge for the surgeon while dissecting the kidney's hilum. Additionally, developmental anomalies such as constriction in the region of the pelvic ureter, a double renal pelvis, auxiliary renal arteries, etc., are not unusual. For this reason, successful surgery of the kidney, particularly near the hilum, requires excellent anatomical understanding. There was a 1.25% difference in the arrangement of renal arteries when the hilum of the kidneys was examined anteriorly and in the center, whereas 2.85% of kidneys had a double renal pelvis posteriorly. In 12% of kidneys, the posterior division of the renal artery was visible behind the renal pelvis. Very little (1%) variance is seen here in the renal vessels' middle and anterior positions. However, the location of the renal pelvis, which is always found posteriorly near the hilum, is the same. Occasionally, the renal artery's posterior division is visible behind the renal pelvis.

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